U.S. DEPARTMENT OF ENERGY

2010 Waste Management Symposia

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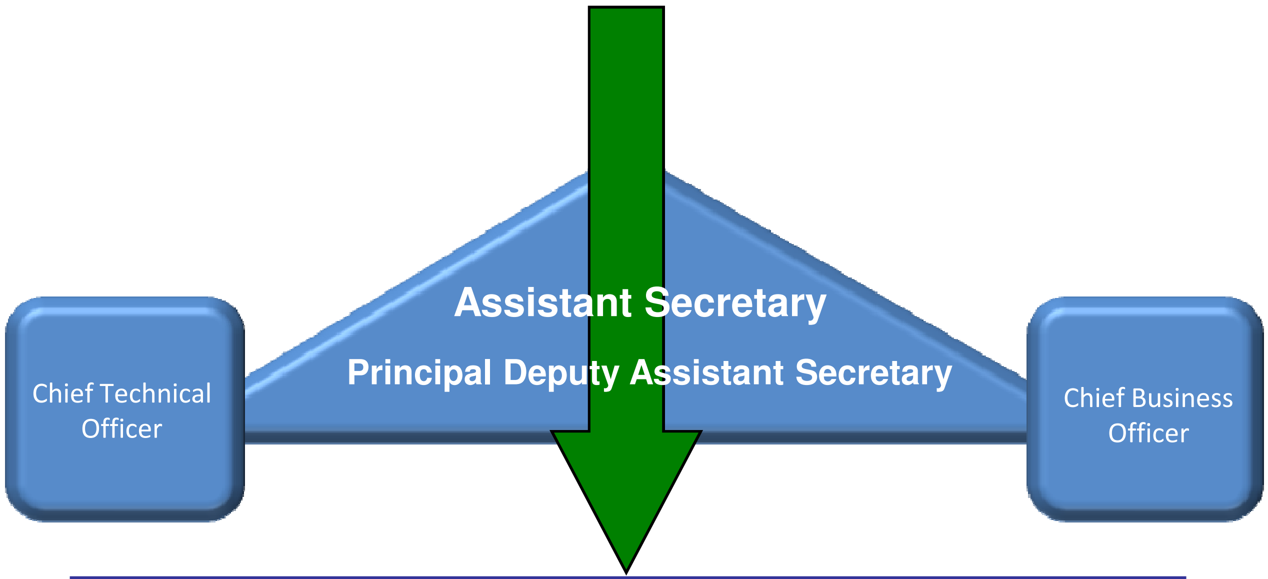
EM is embarked on a Journey to Excellence



Our Vision:
"EM completes quality work safely, on schedule and within cost and delivers demonstrated value to the American taxpayer."

EM Mission and Priorities

"Complete the safe cleanup of the environmental legacy brought about from five decades of nuclear weapons development, production, and Government-sponsored nuclear energy research."






- Activities to maintain a safe, secure, and compliant posture in the EM complex
- Radioactive tank waste stabilization, treatment, and disposal
- Spent nuclear fuel storage, receipt, and disposition
- Special nuclear material consolidation, processing, and disposition
- High priority groundwater remediation
- Transuranic and mixed/low-level waste disposition
- Soil and groundwater remediation
- Excess facilities deactivation and decommissioning (D&D)

EM Program Goals

- **Risk Reduction**
  - Ensure the safety and health of the public and the workers
  - Protect the environment
  - Reduce the EM footprint by 90% by 2015
- **Maintain Compliance**
  - 37 compliance agreements with state and federal regulatory agencies
  - Complete building the capability for dispositioning tank waste, nuclear materials, and spent nuclear fuel
- **EM American Recovery and Reinvestment Act Goals**
  - Thousands of jobs created or saved
  - Reduce the EM footprint by 40% by 2011
- **Improve Project Performance**
  - Improve construction project performance
  - Deliver all projects on time and within cost
  - Get EM projects removed from the GAO High Risk List
- **Establish strategic options for Special Nuclear Materials, Spent Nuclear Fuel, Radioactive Tank Waste, Groundwater and Excess Facilities not currently in the EM portfolio**
  - Overall objective is to reduce life-cycle costs and shorten the period of program execution

EM Strategic Goals

- **Improve Project Management**
  - Restructure the project portfolio
  - Adapt the Office of Science construction project model to EM
    - Construction Project Review, front end planning; appropriate pricing and contingency
  - Establish Performance Metrics for EM operating projects
  - Align project and contract management
  - Streamline the acquisition process

- **Utilize Science and Technology to optimize the efficiency of**
  - **tank waste**
  - **excess nuclear materials**
  - **spent nuclear fuel**
  - **groundwater treatment and disposition**

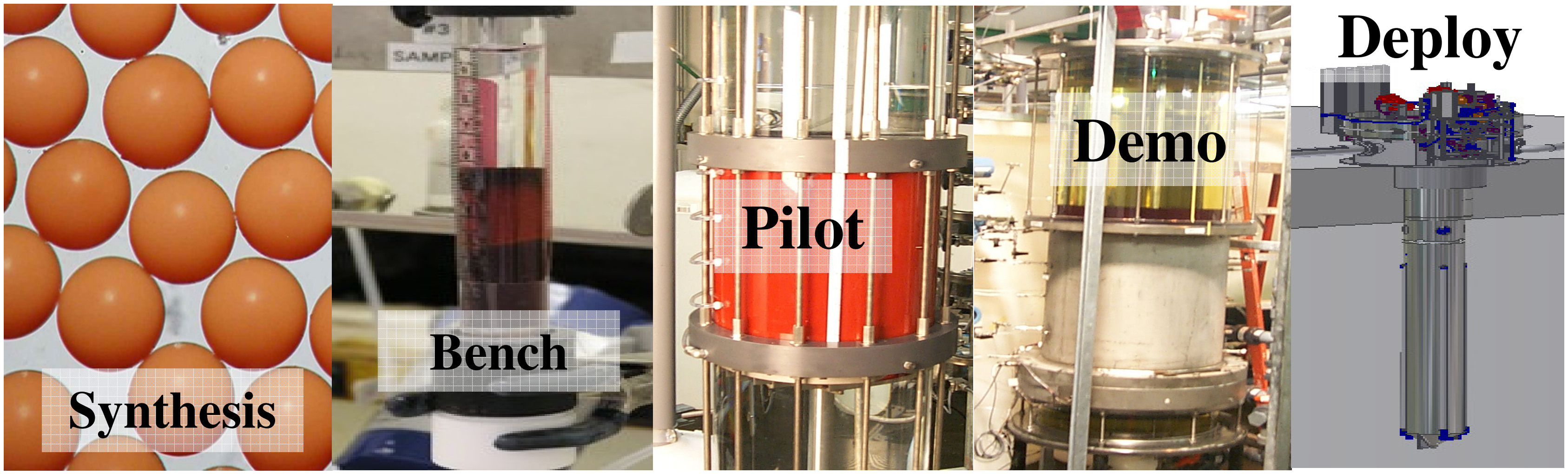
  - Evaluate programmatic alternatives to reduce the life cycle cost and period of execution

Procurement and Contract Management Initiative

- **Expected results: develop specific actions by EM and contractors to fundamentally improve performance**
- **Approach**
  – EM-wide survey to key Federal and contractor staff to identify specific contract management issues and barriers
  – Two targeted workshops: one for key contract executives (March 3) and one for key EM contract managers (March 4) based on survey results to address:
    - What can contractors do to avert performance issues?
    - What can the Federal side do to improve awareness and vigilance?
  – Integrated report developed on actions to be taken by EM and contractors to immediately improve contract performance
  – Follow on vigilance to ensure that all actions are implemented
- **Supports the EM goal to:**
  – Improve construction project performance;
  – Deliver all projects on time and within cost; and
  – Get EM projects removed from the GAO High Risk List

Technology Development Process

(Small Column Ion Exchange)



Operational Requirement Identified — 2003 — 2004 — 2006 — 2008 — 2013

- Technology and Innovation Development has been core provider for developments such as Small Column Ion Exchange
- Process supports bench scale testing to provide conceptual flow sheets, pilot-scaled testing for flowsheet optimization, demonstrations at 1/10 full scale, and deployable designs
- Deployment of Small Column Ion Exchange expected to reduce life cycle by 7 years at Hanford and at Savannah River

Program Status

- **Establishment of the Environmental Management program**
  - Result of Cold War legacy
  - Third largest liability to the United States government and taxpayer
  - Single largest environmental project in the world
- **EM legacy footprint**
  - Past: 3121 square miles at 107 sites in 35 states
  - Projected for end of FY 2011: ~ 450 square miles at 14 sites in 11 states
- **EM is well positioned for continued success**
  - Optimize structure of the portfolio by increasing:
    - Project management focus
    - Operational metrics to ascertain performance
  - Overlay regulatory compliance commitments
  - Best business practices to maximize cleanup progress

20 Years of Progress

- **Tank Waste Management**
  - Stabilized millions of gallons of radioactive tank waste
    - Completed 9 tank closures (2 tanks at Savannah River; 7 tanks at Idaho)
    - Completed 16 tank retrievals
  - Defense Waste Processing Facility operational in 1996
  - West Valley Demonstration Plant
    - Operational in 1996
    - Produced 275 canisters of vitrified high level waste
    - Completed processing in 2002
  - Construction initiated on three additional tank waste processing facilities
    - Hanford Waste Treatment and Immobilization Plant (2003)
    - Savannah River Salt Waste Processing Facility (2005)
    - Idaho Sodium Bearing Waste Treatment Facility (2007)

- **Stabilized 100% of surplus special nuclear materials**
  - Consolidated all EM-owned surplus Pu at SRS
- **Transferred all spent nuclear fuel from wet to dry storage at Hanford (just over 2,100 metric tons)**
  - Hanford K-East Basin closed and D&D complete

20 Years of Progress

- **Transuranic Waste**
  - **Waste Isolation Pilot Plant opened in 1999**
    - World's only operating deep geologic repository
    - Safely disposed of approximately 64,000 cubic meters of transuranic waste in first 10 years of operation
    - First contact-handled transuranic waste shipment in March 1999 from Los Alamos
    - First remote-handled transuranic waste shipment in January 2007 from Idaho
- **Groundwater**
  - **Treated over 240 square kilometers of contaminated groundwater**
  - **Stabilized more than 180 contaminated groundwater plumes**
    - Hanford—migration to the Columbia River
    - Idaho—Snake River aquifer
- **Accelerated completion of two large former weapons production facilities**
  - **Rocky Flats—50 years ahead of schedule, saving ~$20 billion from original estimate (2005)**
  - **Fernald—23 years ahead of schedule, saving $200 million from original estimate (2006)**

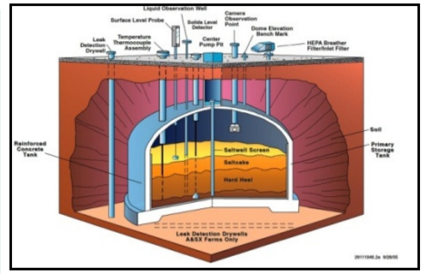
FY 2011 Budget Request Highlights

- **Funds tank waste management and treatment activities across the complex**
  - Hanford Waste Treatment and Immobilization Plant ($740M)
    - to accelerate completion of design
  - Savannah River Salt Waste Processing Facility ($288M)
    - for construction and pre-operations
  - Idaho Sodium Bearing Waste Treatment ($6.5M)
    - to complete construction activities
  - Tank waste retrievals at Hanford and Savannah River ($95M)
    - to meet regulatory commitments
- **Increased funding at Portsmouth to support accelerated D&D**

FY 2011 Budget Request Highlights

- **Increased technology investments**
  - Tank Waste Technologies ($60M)
    - Optimize tank waste disposition resulting in technology insertion points into the tank waste system that will yield significant cost savings and reduce the period of execution
  - Groundwater Remediation ($25M)
    - Understand and quantify the subsurface flow and contaminant transport behavior in complex geological systems
- **Small site completions**
  - Brookhaven National Laboratory ($13.8M)
  - Stanford Linear Accelerator ($3.5M)
  - Separations Process Research Unit ($12.5M)
  - General Electric Vallecitos Nuclear Center (less than $100k)

Waste Retrieval and Closure Technologies



Challenge

- Increase capability to remove tank waste material
- Reduce waste volumes
- Increase storage capacity in existing tanks
- Ability to assess environmental safety of grouted waste residuals in tanks

Possible Solutions

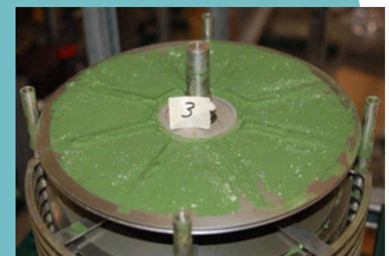
- Develop alternative chemical cleaning methods to control tank heel chemistry
- Develop improved methods for tank waste handling and tank space usage
- Develop in-tank settling technologies to separate radionuclides
- Evaluate cementitious materials for in tank closure

Benefits

- Reduces retrieval time and improves efficiencies
- Reduces further environmental impact when retrieving from unsound tanks
- Reduces waste volume to maximize available tank space
- Provides backup evaporative capability to single large evaporator
- Provides predictive modeling and materials for tank closure decisions

Alternative Waste Pretreatment

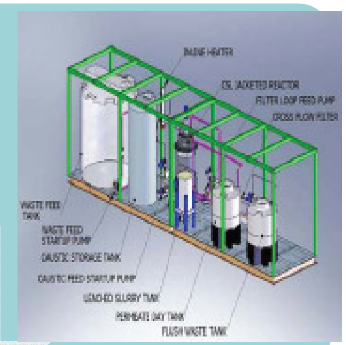
Challenges



- Accelerate tank waste treatment by using small, at-tank systems
- Increase incorporation of long-lived radionuclides in immobilized waste forms
- Remove glass-limiting, non-hazardous chemicals from waste to increase WTP's efficiency
- Obtain reliable data without physical sampling

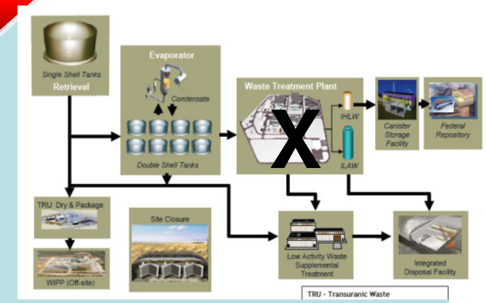
Possible Solutions

- Develop At-Tank/Near-Tank processing to provide supplemental waste treatment cap.
- Develop approaches for managing Technetium during processing
- Develop in-situ tank characterization technologies
- Develop advanced separation technologies to address key waste constituents (aluminum, sodium and sulfate removal; Lithium Hydrotalcite process for sodiu removal, beginning with bench-scale testing)

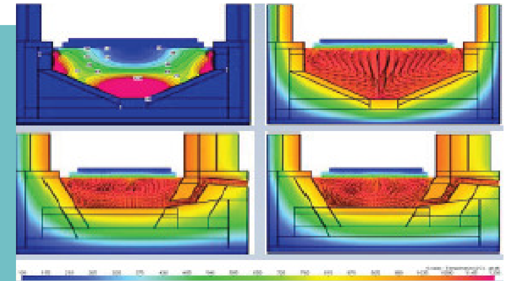


Benefits

- Decrease WTP mission duration
- Reduce or eliminate second LAW facility
- Increase WTP efficiency
- Reduce amount of glass produced, thus reducing disposal costs
- Minimize releases to Hanford soils and groundwater
- Reduces worker exposure and gives real-time data for process control

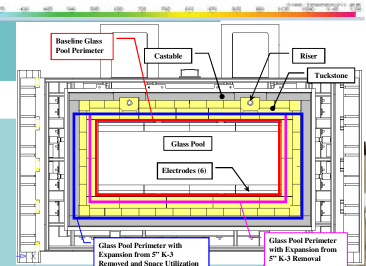


Improved Vitrification Capacity



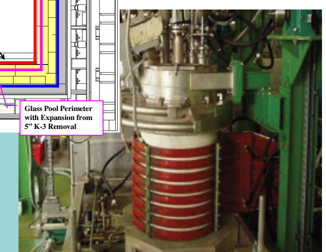
Challenges

- Next generation melters are needed to increase WTP throughput
- Develop understanding a process tools for maintaining cold cap on melt surface



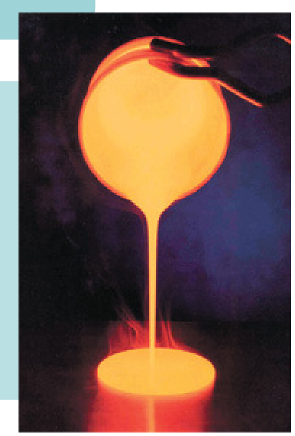
Possible Solutions

- Develop next-generation melters such as advanced joule-heated melter and cold crucible induction melter
- Develop advance process understanding of cold-cap chemistry



Benefits

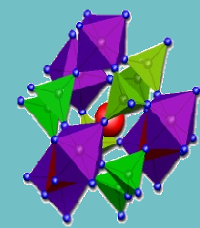
- Increase WTP efficiency by increasing melter throughput and increasing waste loading
- Increase flexibility in alternative waste forms
- Increase steady state operations by reducing process upsets



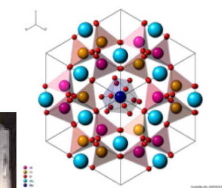
Increased Waste Loadings

Challenges

- Reduce total amount of glass by increasing waste loaded into the glass
- Develop treatment options for broader range of wastes including selected LAW's



iron phosphate local structure



Possible Solutions

- Increase waste loading to reduce the total amount of glass produced
- Develop Alternative Treatment and Disposal Processes

Benefits

- Increases WTP efficiency by increasing waste loading into glass without effecting melt rates.
- Reduces the amount of additional LAW capacity needed
- Provides another waste form for immobilizing waste from entering the environment

Advanced Simulation Capability for Environmental Management (ASCEM)

Challenge

Current performance assessments (PAs) and risk analyses do not always provide realistic estimates of cleanup time and costs due to poor understanding of contaminant fate and transport processes in the subsurface and difficulties in predicting long-term performance of engineered barriers.

Solution

Develop an integrated, high-performance computer modeling capability for waste degradation and contaminant release; multiphase, multicomponent, multiscale subsurface flow and contaminant transport; and environmental exposure and risk assessment, with systematic uncertainty analyses, to support the next generation of PAs.

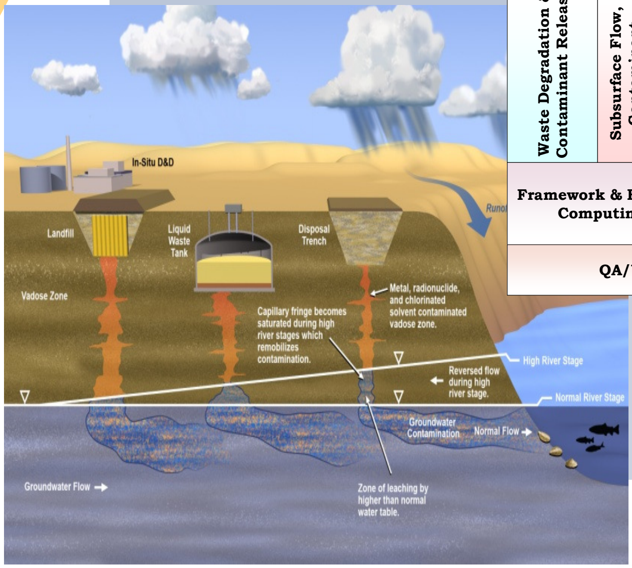
Approach

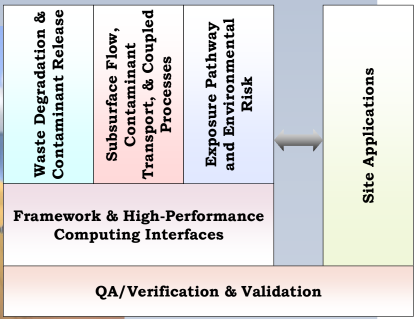
Progress in SciDAC, SESP, and EFRC (SC) research on subsurface processes; recent advancements in high-performance computing technologies; similar advanced modeling and simulation programs of NE and FE; and RW's total system performance assessment provide essential building blocks and valuable lessons learned for developing ASCEM.

Teaming with SC, NE, RW, and FE as well as other Federal agencies (through ISCMEM) enables full leveraging of existing work for maximum returns on investment.

ASCEM Description

ASCEM is a state-of-the-art scientific tool and approach for understanding and predicting contaminant fate and transport in natural and engineered systems. The modular and open source high performance computing tool will facilitate integrated approaches to modeling and site characterization that enable robust and standardized assessments of performance and risk for EM cleanup and closure activities. Use of ASCEM will help EM better estimate cleanup time and costs, and reduce uncertainties and risks.





Infusion of Recovery Act Funds

- Recovery Act leads to job creation and environmental cleanup progress
  - More than 99% of Recovery Act funds have been allocated to sites
  - $5.77 billion obligated to contracts for EM Recovery projects
  - Over $1.1 billion spent on Recovery work as of January 2010
  - Achieved 136% of EM small business contracting goal
  - Across EM, $2.3B awarded to small businesses as of September 2009
    - Recovery Act Total: $697M
      - Prime Contractors: $397M
    - Base Program Total: $1.6B
      - Prime Contractors: $393M
  - Thousands of jobs created or saved

RECOVERY.GOV

Infusion of Recovery Act Funds

- Recovery Act accomplishments
  - Drives EM footprint reduction
    - 40% by September 2011; ~900 square miles to ~450 square miles
  - Removal of 2 million tons of mill tailings from the Moab site on the Colorado River to a disposal cell 30 miles away
  - Accelerate disposition of legacy transuranic waste inventories at 11 sites by seven years, from FY2022 to FY2015
  - Build out of infrastructure needed to support waste processing operations once construction complete ($200M SRS; $326M RL)
- Acceleration of 3 small site completions to FY 2011
  - Brookhaven National Laboratory
  - Stanford Linear Accelerator
  - Separations Process Research Unit

EM International Objective: Continuing 15 Years of Cooperation

- **Purpose**
  - Study mutual waste management challenges
  - Continue international cooperation that has produced tangible results in the cleanup efforts
- **Current projects—Russia & Ukraine**
  - Focus on high-level waste and EM site cleanup needs
- **Strategy**
  - Focus cooperation on EM's accelerated closure mission
    - Align with EM Technology Roadmap and Multi-Year Program Plan
  - Leverage international expertise and experience
  - Continue highly-beneficial relationships with leading international scientists
  - Promote the sharing of lessons learned
  - Be an effective mechanism to coordinate national laboratory, university, and industry activity at an international level
  - Promote the EM mission through a focus on transformational solutions

"Energy, Economy, Environment, and Education are Inextricably Linked"

The Challenge: Maintaining Momentum

- Safely conducting work
- Managing performance-based projects with life cycles over several decades
- Producing results with robust project management practices
- Applying first-of-a-kind technologies
- Achieving footprint reduction and near-term completions
- Managing and maintaining an "able and stable" workforce
- Using Recovery Act funds to create sustainable environmental cleanup jobs, with lasting economic benefits